

DUF₆

Depleted Uranium
Hexafluoride
Conversion Project

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SAMPLING AND ANALYSIS PLAN

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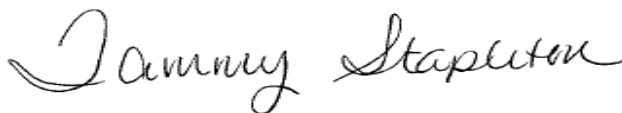
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Depleted Uranium Hexafluoride Conversion Project

Sampling and Analysis Plan

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DUF₆ CONVERSION PROJECT

SAMPLING AND ANALYSIS PLAN

Revision Summary

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LIST OF ACRONYMS

DQO	Data Quality Objectives
EPA	Environmental Protection Agency
LLW	Low-Level Waste
NTS	Nevada Test Site
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage, and Disposal Facility
UDS	Uranium Disposition Services, LLC
WAC	Waste Acceptance Criteria
WCO	Waste Certification Official
WM&T	Waste Management and Transportation

1 PURPOSE AND SCOPE

The purpose of this document is to ensure that all data collected for use in waste management decision-making are scientifically valid, defensible, and of known precision and accuracy to identify the chemical, physical, and radiological properties of waste destined for shipment off-site for recycling, treatment, or disposal.

This plan does not include environmental sampling, process control sampling, or sampling required by nuclear material control and accountability procedures.

2 RESPONSIBILITIES

2.1 OPERATIONS AND MAINTENANCE MANAGER

The operations and maintenance manager has the responsibility for the following:

- Ensure that the requirements of this plan are implemented.
- Final approval authority for project-wide procedures and instructions that implement elements of this plan.

2.2 WASTE DISPOSITION MANAGER

The waste disposition manager has responsibility for the following:

- Ensure that all data collected per this sampling and analysis plan (SAP) are adequate to characterize the material and other wastes generated
- Review all procedures or work instructions that implement elements of this plan
- Provide guidance on characterization and packaging requirements to waste generators
- Review and approve data quality objectives (DQO) statements for sampling prior to implementation
- Review and approve waste characterization determinations
- Coordinate shipment of samples to off-site laboratories

2.3 PLANT MANAGER

The plant manager is final approval authority for site specific procedures and/or instructions that implement elements of this plan.

2.4 QUALITY MANAGER

Ensure that service providers such as offsite laboratories are qualified per applicable requirements.

2.5 OFF-SITE LABORATORY

NOTE: The off-site laboratory includes the United States Enrichment Corporation laboratories as well as vendor laboratories.

Off-site laboratories are responsible for analysis of the samples, data validation, and reporting as requested by Uranium Disposition Services, LLC (UDS).

3 PROGRAM DESCRIPTION

3.1 OVERVIEW

The general approach developed for characterizing the waste is initially to categorize the waste population needing sampling by determining the DQOs. The information gathered from the sampling campaign will allow for the development of waste determination packages, waste profiles, and transportation paperwork. The DQO process will be the primary means to begin the waste stream characterization process. In this step, waste container information will be evaluated based on generation areas, available process knowledge information, and any historical data.

As waste is selected for disposition, a primary disposition path shall be selected. In the event that a primary path is unknown, the waste shall be characterized and verified to meet the Nevada Test Site (NTS) Waste Acceptance Criteria (WAC). This phase will also address how waste will be selected to verify /determine waste contents and ensure that no prohibited waste items are present. A visual examination effort will be conducted, when necessary, to ensure that the waste is compliant for off-site certification. In some cases, radiological results will be used to confirm or finalize the initial DQO process and allow development of waste stream data packages. At the conclusion of this visual examination and waste stream characterization phase, nuclides will be quantified. At this point, the waste will be eligible for certification and off-site disposal.

Samples will be collected of various waste types as directed by the applicable DQOs generated as required by the SAP. Records will be kept to trace each sample number to a specific container number or waste stream. For purposes of this SAP, sampling and analysis may also include non-destructive measurement of radiological and/or chemical properties of the waste, either in the field or in the laboratory.

Radiological and chemical results will be used to develop new waste profile information and to confirm existing waste profile parameters. Chemical analysis results will be used to perform a hazardous waste determination in accordance with state and federal regulations. In the case where two regulatory requirements apply, the most stringent shall be followed. Based on the available process knowledge of the material, chemical analysis may not be required.

Characterization of the material may be performed in stages as information is collected and evaluated. Therefore, the characterization approach and this SAP may require future revision.

3.2 DATA QUALITY OBJECTIVES

UDS uses a process to identify the DQOs for the characterization parameters and acceptable uncertainty in characterization data. The DQO process will promote a structured approach to the collection and use of waste characterization data to avoid the collection of data that is not necessary or defensible.

The type, quantity, and quality of characterization data obtained for the safe management of waste need to be consistent with the purpose for which the characterization information will be used. The uses of waste characterization data include:

- Complying with Treatment, Storage, and Disposal Facility (TSDF) WAC
- Determining radiation shielding and other protective measures
- Evaluating compliance with processing requirements
- Meeting legislative or regulatory commitments

The objectives of the DQO process are to:

- Manage and control the risks of making incorrect decisions
- Determine the data required to support making specific decisions
- Determine the type and quality of required data
- Allow responsible personnel, decision makers, data users, and relevant technical experts to participate in planning and assessment
- Determine the quantity, location, and type of samples required
- Quantify the uncertainty in data through development of statistical sampling plans
- Reduce overall costs by identifying resource-efficient sample collection and analytical methods by optimizing the sample and analysis plans

Key activities of the process include:

- Preparation of the DQO documentation
- Identification and training of responsible personnel
- Identification of technical experts
- Ensuring opportunities for input and coordinating stakeholder and technical experts into the DQO process
- Review and comment on the DQOs
- Approval of the DQO documents

The DQO process consists of seven steps. The output from each step influences the choices made in later steps or may lead to a reconsideration of prior steps. This iterative process leads to a more efficient data collection design. The following is a listing and brief description of each of the seven steps:

State the Problem: Concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding for defining the problem.

1. **Identify the Decision:** Identify what questions the study will attempt to resolve and what actions may result.
2. **Identify the Inputs to the Decision:** Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.
3. **Define the Study Boundaries:** Specify the time periods and spatial area to which decisions will apply. Determine when and where data should be collected.
4. **Develop a Decision Rule:** Define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions.

5. ***Specify Tolerable Limits on Decision Errors:*** Define the decision-maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision.
6. ***Optimize the Design:*** Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs.

3.3 TRAINING

Personnel are trained to the correct work methods and controls to assure safe performance and quality of work. Training of subcontracted laboratory personnel is in accordance with their quality assurance (QA) program.

3.4 HEALTH AND SAFETY

Radiological and chemical hazards are associated with this sampling and analysis effort. Procedures, work instructions, radiological work permits, activity hazard analysis, and other work instruction documents will describe field activities and provide safe working limits to ensure personnel safety and protection of the environment.

4 MEASUREMENT AND DATA ACQUISITION

4.1 SAMPLING PROCESS DESIGN

A waste stream is a waste or group of wastes from a process or facility having similar physical, chemical, and radiological properties. Waste stream characterization is the process by which a particular waste stream is defined based on its physical, chemical, and radiological properties. Waste stream characterization shall be performed and communicated in accordance with UDS-U-WMP-1001, *Waste Characterization*. This sampling and analysis plan provides support to the characterization process by defining the sampling process and providing guidance for proper implementation to ensure defensible data are obtained. Once the waste properties are fully understood and documented through the characterization process, waste streams can be formally documented and justified through development of waste profiles and associated determination packages.

The waste stream characterization process will be initiated by reviewing available data from historical records, preliminarily grouping containers from individual generation areas, and acquiring radiological data. During waste processing or collection, representative samples will be taken of the various waste media for chemical and radiological parameters, as necessary. These samples will be used to develop and verify isotopic distributions of the waste.

If adequate radiological and chemical process knowledge information exists, these samples will serve as a confirmatory measure to support a waste profile or determination package. If process knowledge is insufficient or questionable, more robust sampling measures will be required to establish definitive isotopic abundances to be used for quantification purposes. The following sections describe how wastes will be characterized on a waste stream basis.

4.2 *PHYSICAL CHARACTERISTICS*

Disposal facilities require that each waste stream's physical make-up be described. To satisfy this objective, documented evidence must exist to show the waste's physical characteristics.

During waste collection, waste items collected shall be visually inspected, adequately described, and documented. A surveillance of waste collection shall be periodically performed to ensure compliance with receiving facility WAC. In some cases, visual inspection may not be sufficient for physical characteristic determination and sample collection may be warranted.

For process wastes, a visual inspection may not be possible due to safety concerns. Therefore, process parameters, such as feed quantities, compaction, etc., shall be used in lieu of actual visual examination to determine the physical characteristics.

4.3 *NUCLIDES OF CONCERN*

Low-level waste (LLW) disposal facilities require that nuclides of concern and associated activity ranges be determined for each waste stream. Depending on the off-site facility for which the waste will be disposed, nuclides of concern may vary. For example, NTS requires that any nuclide contributing greater than one percent of the total activity or those that contribute greater than 0.01 times the action levels specified in the NTS WAC be reported. While many of the nuclides that are required to be reported by TSDFs are similar, their reporting levels may be different. Since waste may be disposed at either NTS or EnergySolutions, reportable nuclides will simply be referred to as nuclides of concern.

During the sampling, representative wipes or physical samples will be obtained for radioanalysis. In some cases, non-destructive assay may be used for radiological determination. This sampling effort will be conducted through development and implementation of comprehensive DQOs. Once the analytical results are obtained from the field measurement or the off-site laboratory, the data will be validated, as necessary, to determine the overall usability for characterization purposes.

Validated radioanalytical data will be used to establish nuclides of concern and allow determination of isotopic distribution for each waste stream. Nuclides of concern and associated distributions are important since they are used to define the radiological properties for the waste material in question. Nuclides of concern and their activity levels are also required to be documented on the waste profile and be technically justified. Therefore, each waste stream characterization determination package will be supported by a radiological technical basis that will justify all radiological parameters cited on the disposal facility's waste profile.

4.4 *HAZARDOUS WASTE AND PROHIBITED ITEM DETERMINATION*

Based on the preliminary evaluation of the waste materials, it will be determined if process knowledge can be used to characterize the waste stream. The evaluation will include review of waste generator information, process parameters, and available documentation. If information is lacking, additional information may be requested of the waste generator. Appropriate sampling techniques or visual examination will be implemented to establish the appropriate waste profile information. If necessary, representative samples will be obtained for Resource Conservation and Recovery Act (RCRA) constituents and the sampling process documented through the approved DQO process.

Once analytical data are received, a characterization summary will be documented in the form of a RCRA technical basis. If RCRA hazardous waste items are discovered during the visual examination or noted on the waste item log, they will be segregated and accumulated until an alternate disposition pathway is identified. Under no circumstances will hazardous materials be disposed at NTS. Likewise, prohibited items and materials will be segregated from compliant LLW and managed appropriately as determined by Waste Management and Transportation (WM&T) personnel.

It should be noted that UDS does not anticipate the generation of hazardous waste with the exception of recycle items such as batteries and light bulbs. Analytical data indicating RCRA waste should be evaluated in a timely manner and its source identified for appropriate management.

The Toxic Substance Control Act (TSCA) regulated waste is expected and should be considered for activities associated with polychlorinated biphenyls painted cylinders. Sampling of suspected TSCA-regulated waste may occur based on the use of process knowledge. A TSCA technical basis shall be documented in accordance with UDS-U-WMP-1001, *Waste Characterization*.

Laboratories shall perform analysis of the constituents in accordance with applicable SW-846 sample methods.

4.5 *SAMPLING METHOD REQUIREMENTS*

Specific requirements for collecting samples will be documented in project-specific work plans, work instructions, procedures, or DQOs. The work instruction document will incorporate Environmental Protection Agency (EPA) requirements or guidelines for collection of samples. The appropriate guidelines will be determined by the analytical information needed. The appropriate EPA method will be referenced.

Applicable DQO statements will also dictate any specific sampling requirements.

4.6 *SAMPLE HANDLING AND CUSTODY REQUIREMENTS*

The work instructions or procedures provide direction for overall sample handling activities. Radiological considerations will primarily govern physical sampling handling requirements. Shipment of samples will be conducted in accordance with applicable UDS procedures and will meet all Department of Transportation requirements.

4.7 *ANALYTICAL METHODS REQUIREMENT*

Laboratory sample preparation and test methods must conform to applicable Department of Energy, Nuclear Regulatory Commission, UDS, EPA, and ASTM requirements. Sample preparation by the analytical laboratory will also be by approved procedures and may entail a leaching or complete dissolution of the sample depending on the specific matrix. The exact method of sample preparation is not specified here to allow for judgment and flexibility by laboratory personnel when dealing with complex sample matrices. If the preparation method is unsuccessful in removing all detectable radioactivity from the sample, the laboratory will determine the approximate percentage of activity that remains in the undissolved portion. Choice of the appropriate preparation method will be made by the laboratory at the time of preparation and analysis.

Modification of standard and prescribed preparation and analysis methods may be necessary due to the contamination levels in the sample or due to a non-routine sample matrix. This is anticipated due to the high level of uranium and possible interference with other metals. These modifications will be documented by the laboratories and approved by WM&T personnel.

The detection limits achieved for hazardous waste metals will be at a minimum the limits defining hazardous waste from 40 C.F.R. Part 61.

4.8 *QUALITY CONTROL REQUIREMENTS*

Quality control samples to ensure that data quality can be documented (duplicates, trip blanks, field blanks) will be put into place and documented in the project-specific work instructions.

Laboratory quality control will be governed by the current laboratory subcontract.

4.9 *INSTRUMENT AND EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS*

Inspection and maintenance of instruments and equipment must be performed as needed.

4.10 *DATA ACQUISITION REQUIREMENTS*

Any non-measurement data, such as historical data or literature data, used in this SAP must be traceable to the document from which it was obtained.

4.11 *DATA MANAGEMENT*

Once field measurements and laboratory analysis data are obtained, they will be managed and controlled in accordance with the applicable procedure or written work instructions. This will ensure that data traceability and custody are maintained. A data package containing appropriate data management documentation will be produced.

Once the data package is completed, the data will be assessed for usability. A data quality assessment report will be generated by qualified UDS personnel or subcontractors, which will determine if the data are complete, precise, accurate, and representative and satisfy the DQOs. Once the assessment is complete, one of two conclusions will be provided: (1) the percentage of data that are "complete" is insufficient and more data collection or sampling and analysis needs to be performed; or (2) sufficient useable data are available and decisions can be made regarding waste segregation and categorization.

Qualified personnel will validate all data using approved data validation procedures.

5 *ASSESSMENT AND OVERSIGHT*

Deficiencies or non-conformances identified during field activities will be corrected in the field if possible, or work will be stopped and the deficiencies addressed. Assessments or surveillances may be performed as required by the cognizant work organization, the WCO, or QA. Corrective actions and follow-up to assessments will be conducted per UDS-U-QAP-0005, *Condition Reporting*.

6 DATA REVIEW, VALIDATION, AND USABILITY

6.1 DATA REVIEW AND VERIFICATION REQUIREMENTS

The initial data quality review of analyses will be performed by the laboratory.

6.2 VERIFICATION METHODS

An internal review of radiochemical analysis data will be conducted by the selected laboratory using approved procedures. The review should include verification for accuracy and precision according to the methods employed and laboratory protocols and for adherence to specified QA/quality control (QC) requirements. In addition, the data should be reviewed for QC sample acceptance criteria.

Prior to submittal of the data package to UDS, the appropriate laboratory supervisor will ensure that all requested analyses have been performed and verified for completeness of data prior to approval.

Qualified personnel will validate all data using approved data validation procedures.

6.3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

Decisions that determine if the DQOs have been satisfied will be made by WM&T personnel, waste certification official (WCO), or subcontractors once the data package has been received from the laboratory. This process of evaluating all data used in this SAP will include, but not be limited to, the following:

- Notation of the radionuclide or chemical concentrations that consistently measure above minimum detectable amounts
- Evaluation of these concentrations for acceptability based on their uncertainty
- Notation of the radionuclide or chemical concentrations that were flagged in the validation process
- A comparison of the relative abundances of the radionuclides or chemicals to historical data and process knowledge
- A check of QC parameters against criteria outlined in the DQOs
- Demonstration that isotopic or chemical concentrations of waste are compliant with applicable action levels
- Presentation of conclusions about the data concerning the principle study questions

6.4 STATISTICAL EVALUATION

Statistical evaluation of the analytical data shall be performed in accordance with SW-846 and the receiving facility WAC. The evaluation shall be documented, as appropriate, in a technical basis or as part of the DQO process.

Guidance for utilizing statistics within the characterization or for profile development is provided in UDS-U-WMP-1001, *Waste Characterization*, and the appropriate TSDF profile development procedure.